

FETAL GROWTH AND DEVELOPMENT

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Lennart Nilsson is a pioneer in medical photography, credited with inventing numerous devices and techniques in his field. The photos used in this booklet have been published internationally in scientific periodicals and used in the popular press and television.

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INTRODUCTION

This booklet is designed to give basic information about fetal growth and development from the time of conception through birth. It includes pictures, illustrations and drawings at two week increments along with relevant information about the possibility of the unborn infant's survival.

Two reference points are commonly used for determining the age of the fetus:

Gestational age (*based on a 28 day cycle*) is calculated from the first day of a woman's last menstrual period. About 280 days, or 40 weeks, elapse between the first day of the last menstrual period and the birth of the infant.

Fertilization age is the actual age of the fetus, and is calculated from the estimated day of ovulation. To illustrate,

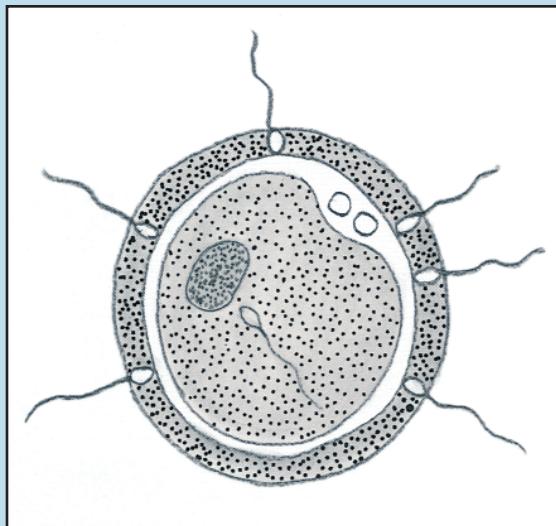
Gestational age (*based on a 28 day cycle*) =
Fertilization age + 2 weeks.

The headings throughout this booklet are listed according to gestational age, which is the common reference point used by health care providers.

While the information provided in this booklet will assist you in making informed decisions regarding your pregnancy, it is not intended to be a substitute for prenatal care. Please contact your physician or health care provider, community health nurse, or local community health center to learn more about fetal growth and development.

Fertilization

Development begins on the day of fertilization – when one sperm penetrates the ovum (egg) and unites with it to form one cell. This combining of the ovum and the sperm causes massive cell division.



Here the human ovum (egg) is surrounded by several sperm. The egg and sperm are highly magnified. One sperm has entered the ovum and is about to fertilize it. The fertilized ovum will develop into an embryo.

The fertilized ovum travels through the fallopian tube to the uterus. About three to four days later the fertilized ovum, which by now has divided many times, has reached the uterus. It begins to implant itself into the soft lining of the uterus between the end of the first week and the beginning of the second week after ovulation.

3 Weeks Gestational Age



Actual Size → .

Gestational age – (based on a 28 day cycle) is calculated from the first day of a woman's last menstrual period. About 280 days, or 40 weeks, elapse between the first day of the last menstrual period and the birth of the infant. Gestational age is also referred to as number of weeks pregnant.

DAY 8

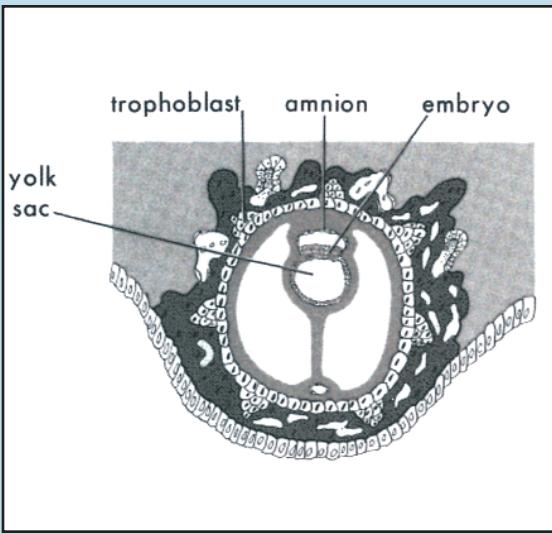
A pregnant woman may notice her first missed menstrual period at the end of the second week after conception, or about four weeks after the first day of her last normal period.

Proper nutrition is important even before conception to provide the best possible environment for the developing embryo. Habits such as smoking, alcohol consumption and drug use should be stopped before conception, or as soon as possible after conception to decrease the danger to the developing embryo and fetus. Whenever possible, speak to your physician regarding preconception counseling or contact the State Department of Health for more information.

4 Weeks Gestational Age



This drawing shows the actual size of the embryo at 4 weeks.



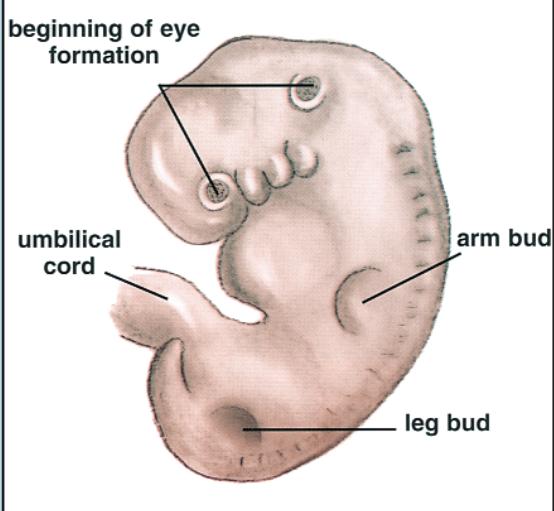
The human embryo, drawn here many times its actual size, is in fact about 1/100th of an inch long.

- The heart begins to form.
- Blood circulation begins.
- Because of the developing body systems, it is important that the mother gets proper nutrition and does not use alcohol, drugs or tobacco.
- Most pregnancy tests that are done in a clinic are positive by this time.

6 Weeks Gestational Age



This drawing shows the actual size of the embryo at 6 weeks.



The embryo is about 1/4 of an inch long.

- By this time the head and upper body are well developed.
- The eyes have begun to form.
- Structures that will become arms and legs, called limb buds, begin to appear.
- The heart, now in a tubular form, begins to beat.
- The neural tube has formed which will give rise to the brain and spinal cord.

8 Weeks Gestational Age

webbed fingers

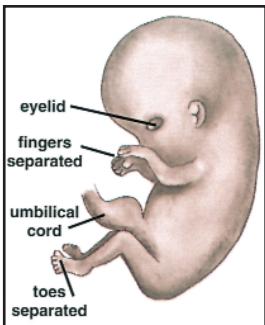


This drawing shows the actual size of the embryo at 8 weeks. The embryo is just over 1/2 inch long.



- The embryo now has a four-chambered heart.
- The vertebral (spinal) column is developed and visible but is composed of cartilage at this stage.
- Electrical activity begins in the developing brain and nervous system.
- The fingers begin to develop.
- Blood is being pumped through the umbilical cord to and from the embryo.
- The bluish amniotic sac surrounds the embryo. The fluid within it protects the embryo.

10 Weeks Gestational Age

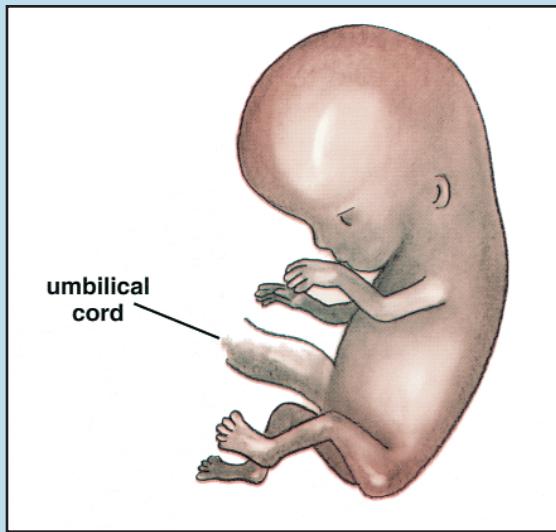


This drawing shows the actual size of the fetus at 10 weeks. The fetus is now about 1 1/2 inches long and weighs almost 1/2 ounce.



- During this period the embryo reaches a transition point. It is now called a fetus, a Latin word meaning young one or offspring.
- The head is about half the size of the fetus and the tail has disappeared.
- The fetus now has a distinct human appearance.
- Arms, legs, fingers and toes are distinctly visible.
- The first real bone cells begin to replace the cartilage.
- Eyelids are formed.

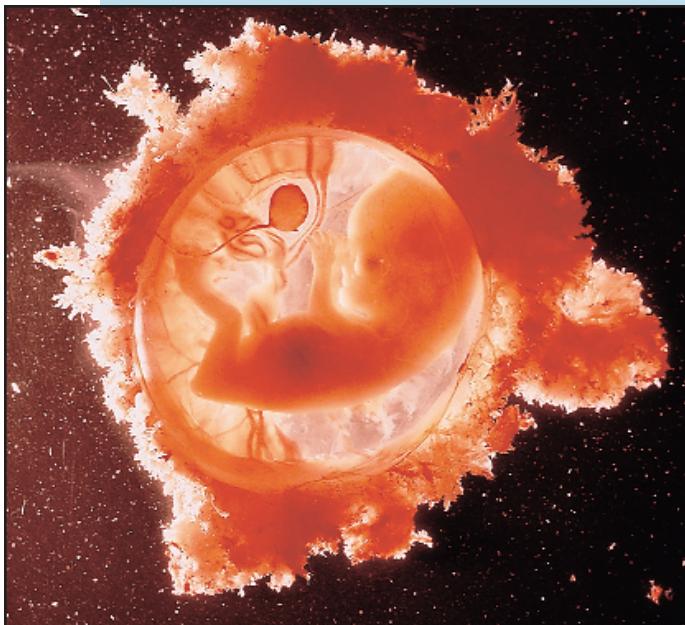
12 Weeks Gestational Age



This drawing shows the actual size of the fetus at 12 weeks. The fetus is about 2 1/2 inches long and weighs about 1 ounce.

- The eyelids fuse together.
- Fingernails are developing.
- Between 10 and 12 weeks, the fetus begins small, random movements that are too slight to be felt by the mother.
- The fetal heartbeat can be detected electronically.
- All major body organs are formed although they are not able to function outside of the uterus. The rest of the pregnancy is needed to allow these organs to grow and mature.

14 Weeks Gestational Age



- The fetus is able to swallow and the kidneys are able to make urine.
- Blood begins to form in the bone marrow.
- The fetus now sleeps and awakens. It has movement of arms, legs, head and neck. The mouth of the fetus is able to open and close.
- The arms are in proportion to the body.
- The fetus is about $3\frac{1}{2}$ inches long and weighs about $1\frac{1}{2}$ ounces.

16 Weeks Gestational Age

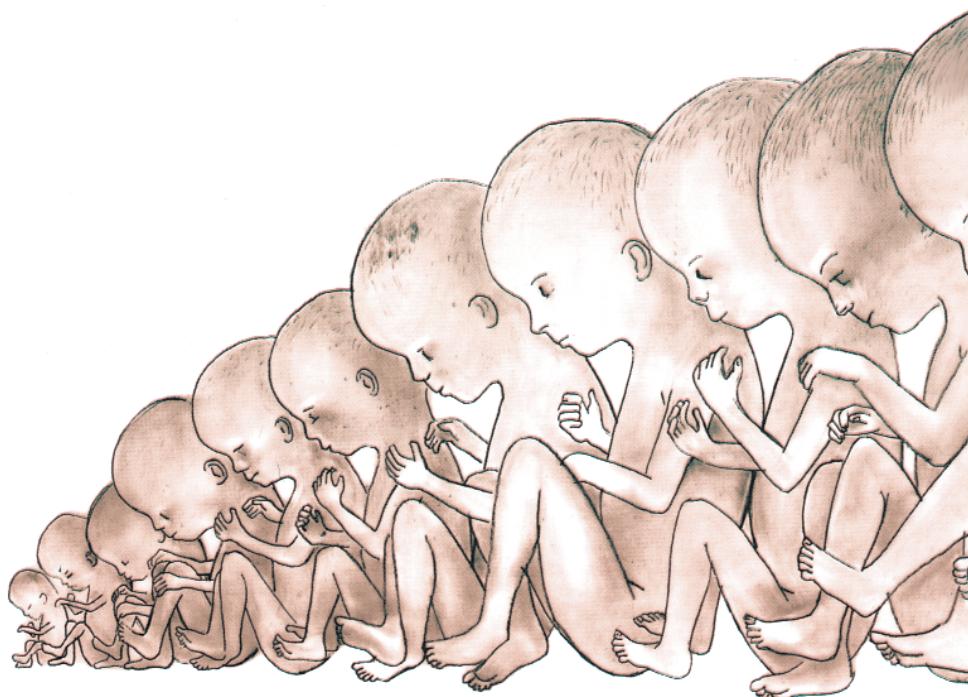
- By this age it is possible to distinguish the sex of the fetus.
- The head is erect and the legs are developing.
- Fine hair, called *lanugo*, has begun to grow on the head.
- The fetus is about 5 to 6 inches long and weighs about 3 to 4 ounces.

18 Weeks Gestational Age

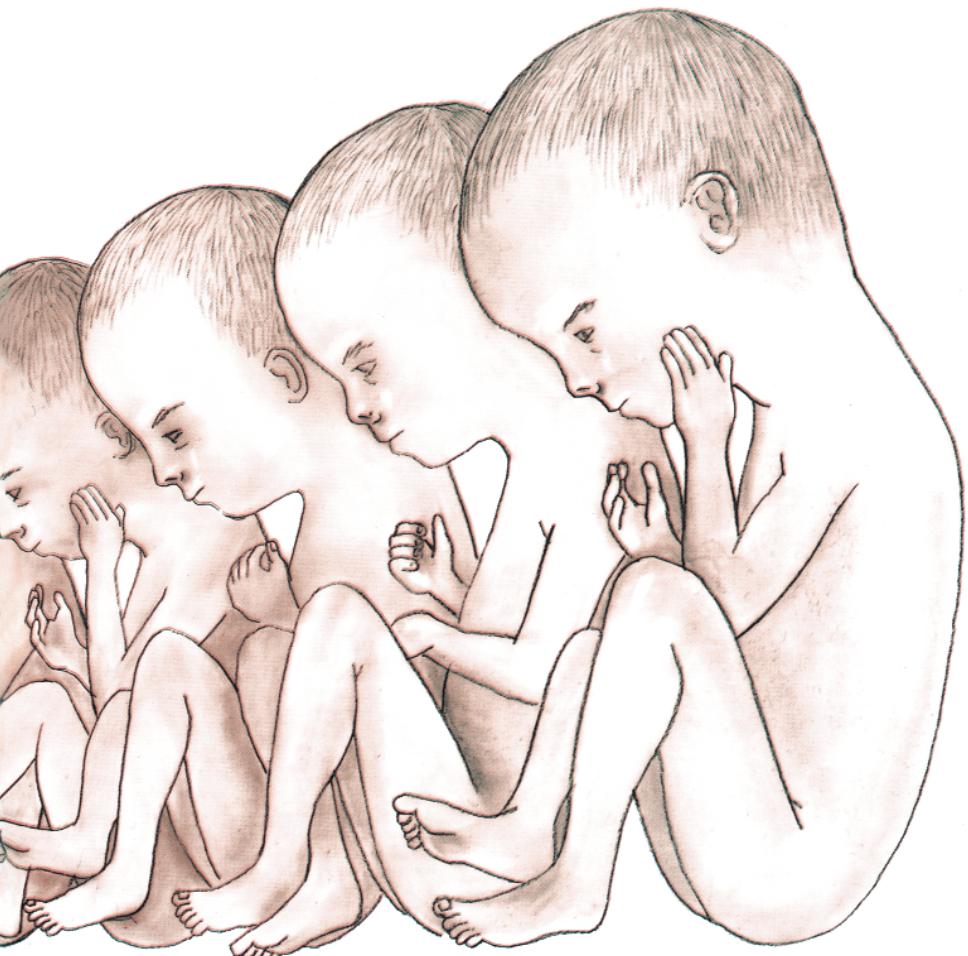


- The body and facial features of the fetus are now recognizable.
- The fetus is able to respond to sound.
- The nose, lips and ears can be recognized at this stage.
- Scalp hair is present.
- A fetus at this age will be unable to survive if born prematurely because it is much too small and the organs are too immature.
- The fetus is about 6 inches long and weighs about 4 1/2 ounces.

Fetal Growth FROM 12 TO 38 WEEKS



12 14 16 18 20 22 24 26 28 30



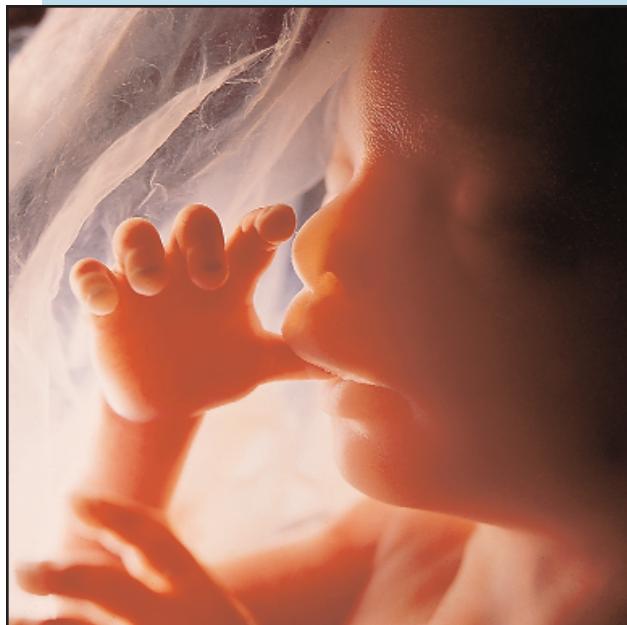
32

34

36

38 Weeks

20 Weeks Gestational Age



- The oil glands in the skin, called *sebaceous glands*, begin to work.
- The mother will be able to feel the fetus move, kick, and punch. The movements are sometimes described as feeling like “movement of butterfly wings or bubbles.” This is called *quickenning*.
- The fetus has been observed to do thumb sucking on ultrasound. The fetus at this stage has the reflex ability to suck and grasp. It may also experience hiccups.
- The fetus is about 6 1/2 inches long and weighs about 5 to 8 ounces.

22 Weeks Gestational Age

- Toenails have begun to develop.
- By 22 weeks the lower limbs are fully formed.
- Head and body hair called *lanugo* thickly covers the fetus.
- The fetus is about 9 inches long and weighs about 1 pound.

24 Weeks Gestational Age



- The fetus begins to gain weight steadily, but still appears “scrawny”.
- The skin is typically wrinkled and red.
- The head is still quite large compared to the rest of the body.
- Eyebrows and eyelashes are recognizable.

24 Weeks Gestational Age

continued

- With expert high-risk newborn medical attention, 60% of the infants born now will live. All will have extensive Intensive Care Nursery (ICN) stays. Forty to fifty percent of those that survive to their first birthday may have a permanent disability.
- The fetus is about 12 inches long and weighs about 1 1/2 to 2 pounds.

26 Weeks Gestational Age

- The fetus can respond to sounds that occur both inside the mother's body and outside in the mother's surroundings.
- The fetus is now about 13 inches long and weighs about 2 pounds.
- The eyelids open and close.
- Approximately 85% of babies born alive now will survive if they are born in a hospital with high-risk newborn experts. These babies will have extensive NICU stays and almost 30% will have a permanent disability.

28 Weeks Gestational Age

- Eyelashes and eyebrows are present.
- The fetus has a good head of hair.
- The thin, red, wrinkled skin of the fetus is covered with a white cheese-like substance called *vernix caseosa* that protects the skin from the drying action of the amniotic fluid.
- The fetus is about 13 1/2 inches long and weighs about 2 1/4 pounds.
- Approximately 91% of the infants born at this age will survive if born at a hospital that provides expert high-risk newborn care. As many as 15% of these infants will have lengthy hospitalizations and permanent disabilities.

30 Weeks Gestational Age

- The lungs of the fetus become more mature with each week that is spent in the uterus. However, if the baby is born now it will still need expert medical help.
- The fetus is now about 14 inches long and weighs about 2 1/2 pounds.
- Approximately 95% of the infants born at this time will survive if born in a hospital with an ICN. Most will spend several weeks in the ICN.

32 Weeks Gestational Age

- *Vernix caseosa* continues to form a thick coat on the skin.
- The fetus continues to grow and mature.
- Toenails are fully formed.
- The body is filling out or “fattening up.”
- The fetus is now approximately 16 inches long, about the length of a football, and weighs 3 to 4 pounds.
- About 97% of the infants born at this time will survive with appropriate high-risk newborn care. Some will have permanent disabilities. Most will spend a few weeks in the ICN.

34 Weeks Gestational Age

- The movements and kicks of the fetus are much stronger now. Sometimes this activity can be seen by watching the mother's abdomen.
- The fingernails reach the end of the fingertips.
- The skin is pink and smooth.
- The fetus is about 17 1/2 inches long and weighs about 4 to 5 pounds.
- More than 99% of the babies born at this time will survive. Some of these babies will require high-risk newborn care. Very few will have permanent disabilities.
- Many babies born at 34 weeks gestational age will be discharged home with their mothers and not require ICN care.

36 Weeks Gestational Age

- *Lanugo* disappears from the face but remains on the head.
- The fetus has fully-formed limbs with fingernails and toenails.
- Muscle tone is developed and the fetus can turn and lift its head.
- The fetus has soft earlobes with little cartilage.
- The fetus is about 19 inches long and weighs about 5 to 6 pounds.
- An infant born at this time has an excellent chance of survival with proper care.

38 Weeks Gestational Age

- The fetus can grasp firmly.
- Skin on the face and body becomes smooth.
- The head continues to be the largest body part.
- The body usually appears plump.
- *Lanugo* is left only on the shoulders and upper body.
- Toenails reach the toe tips.
- The fetus is about 19 1/2 inches long and weighs about 6 pounds.
- Almost all babies born now will live.
- The pregnancy is considered full term and the baby is ready to be born anytime between now and 42 weeks.

40 Weeks Gestational Age

- In males, the testicles are fully descended into the scrotum.
- The chest is prominent; the breasts protrude.
- Fingernails extend beyond the fingertips.
- The baby may now be 20 inches or more in length and weigh 6 1/2 to 9 pounds.

Glossary of Terms

AMNIOTIC FLUID – Water in the sac surrounding the fetus in the mother's uterus.

CONCEPTION – The beginning of development of the embryo.

EMBRYO – The stage of development that occurs approximately 2 weeks after fertilization to the eighth week of pregnancy. This is the period of time that many of the major organ systems are being formed and therefore when developmental defects are most likely to occur.

FERTILIZATION – The uniting of an ovum and a sperm during conception.

FERTILIZATION AGE – The actual age of the fetus, calculated from the estimated day of ovulation.

FETUS – The period of development from 10 weeks gestational age to birth.

GESTATIONAL AGE – (based on a 28 day cycle) is calculated from the first day of a woman's last menstrual period. About 280 days, or 40 weeks, elapse between the first day of the last menstrual period and the birth of the infant. Gestational age is also referred to as number of weeks pregnant.

Glossary of Terms

continued

IMPLANTATION – The process of an embryo embedding itself into the lining of the uterus.

ICN – Intensive Care Nursery.

LANUGO – The fine hair that covers the body of the fetus.

OVULATION – The release of an ovum by the ovary.

OVUM – The female reproductive cell; an egg.

SEBACEOUS GLANDS – Oil glands in the skin.

SPERM – The male reproductive cell.

UTERUS – The hollow muscular organ in the female where a developing embryo implants itself and grows to maturity.

VERNIX CASEOSA – White cheese-like substance that covers the skin of the fetus from about the 28th week of gestation.

NOTES

State (SDCL20-13) and Federal (Title VI of Civil Rights Act of 1964, the Rehabilitation Act of 1973 as amended, and the Americans With Disabilities Act of 1990) law require that the Department of Health provide services to all persons without regard to race, color, creed, religion, sex, disability, ancestry, or national origin.

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